

Verizon Small Cell Program

June 21, 2018



What is a Small Cell?

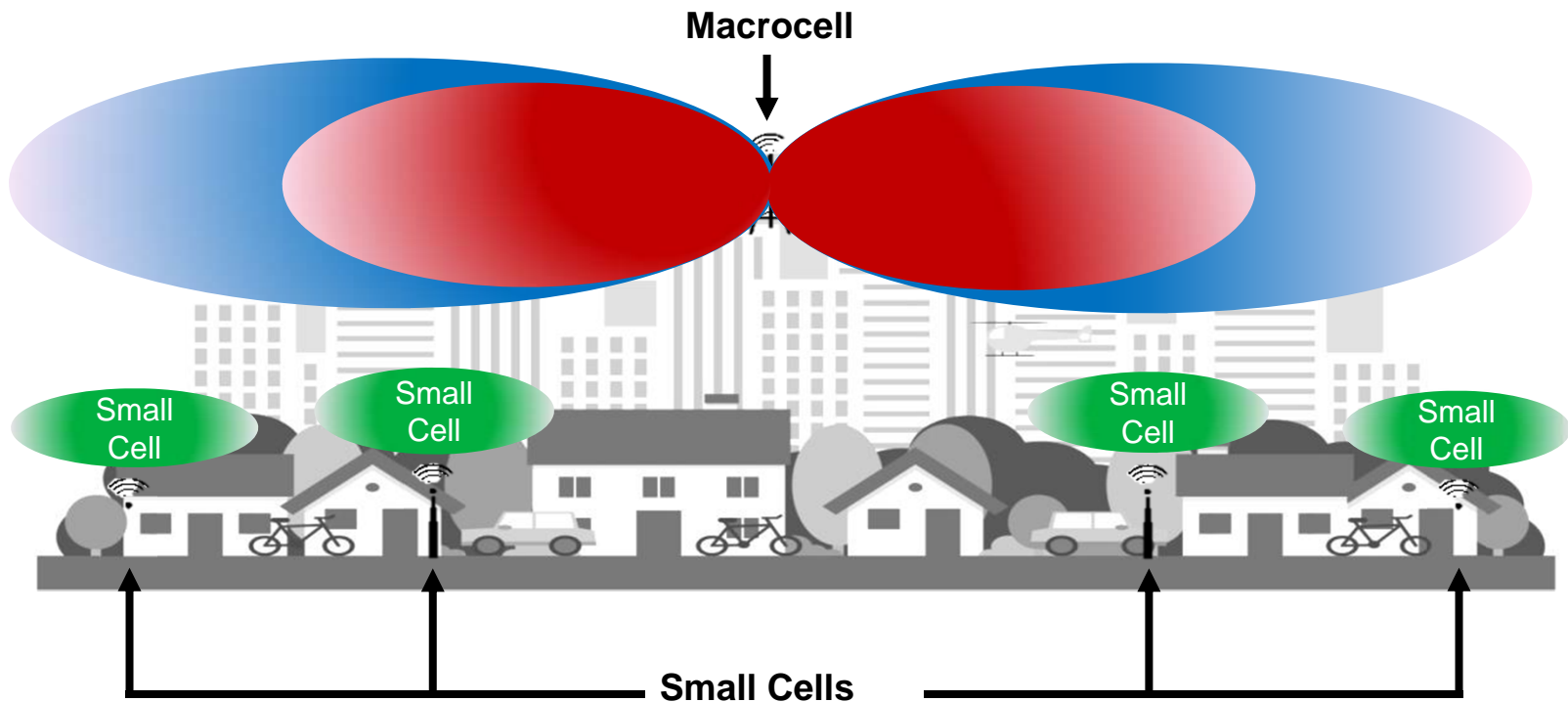
Cell-edge

Mid-cell

Near Cell

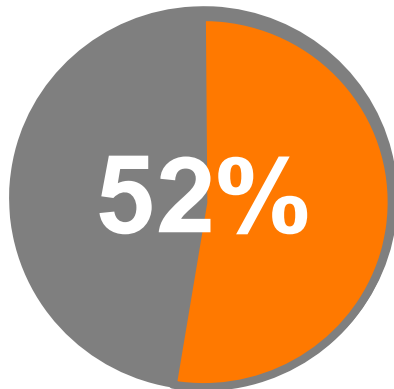
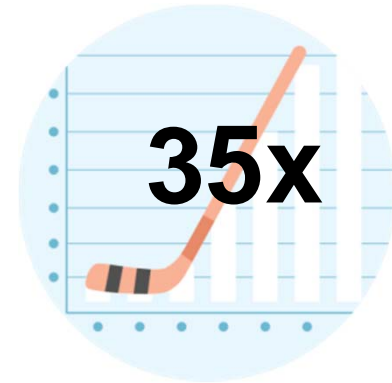
Mid-cell

Cell-edge



Why the Need?

From 2010 – 2016:
Mobile data use  35 times



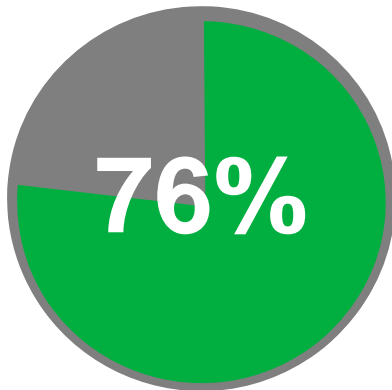
52%+ American Households
Wireless-only

Average American Household:
13 Connected Devices



Why the Need?

**92% of Millennials
have a Smartphone**



**76% of 911 Calls
Originate from a Cellphone**

**Machine to Machine Connections
Projected to Increase from
36M in 2013 to 263M in 2018**



What is The Impact of Insufficient Capacity?

Slow Data Speeds



Increased Video Load Times



Disruption to Video Calls



Dropped or Incomplete Calls

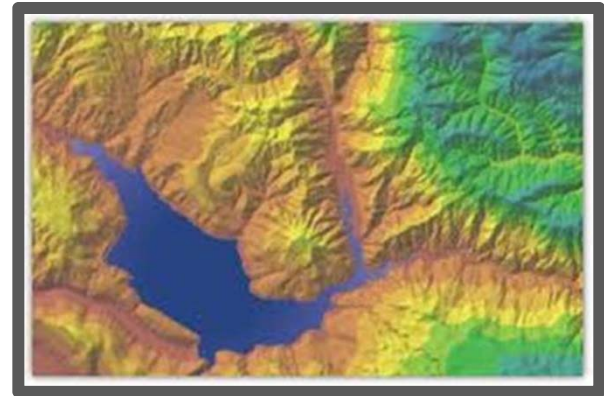


Connection Problems



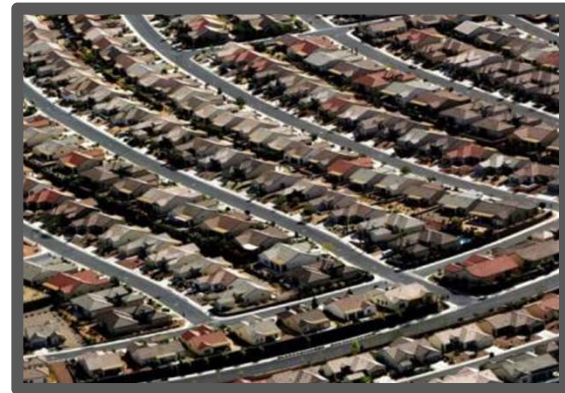
Why Deploy Small Cell? Gaps in Coverage

Terrain Challenges



Tall Buildings

Large Residential Areas



Small vs. Macro Cell – Install

1 to 3 Small Antennas
(less than 3 cubic feet)

Small Radio Enclosure
No Ground Cabinets



**Small Cell on
Utility Pole**

3 to 12 Large Antennas
(averaging 6 to 8 feet tall)

4 to 6 Large Cabinets
on Adjacent Property



**Macro Site on
Utility Pole**

Small vs. Macro Cell – Antenna

Typical Small Cell Antenna

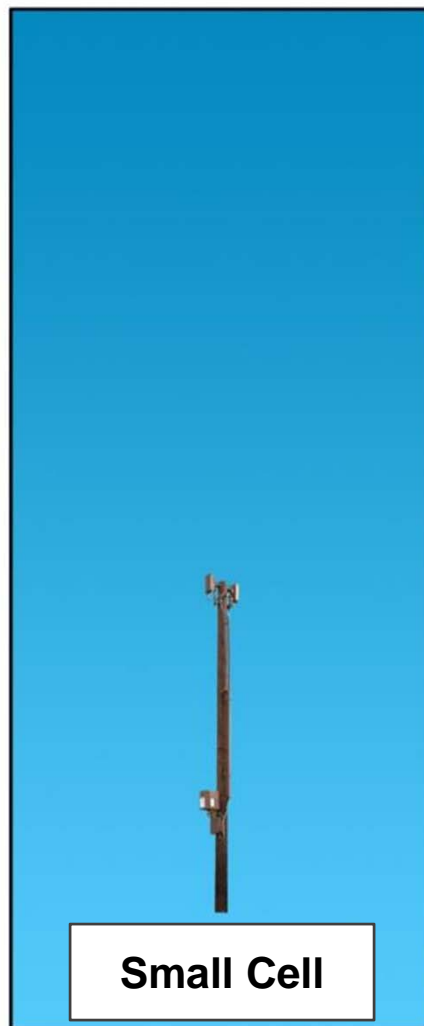
- ~2 ft. in Height
- 1 to 3 per Pole
- Install Height of 20 to 40 ft.
- No Ground Cabinet



Typical Macro Cell Antenna

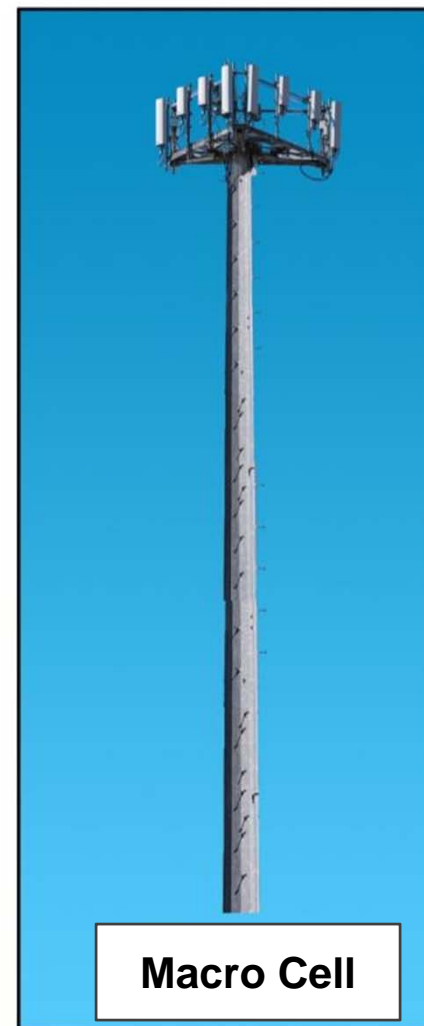
- 6 or 8 ft. in Height
- 6 to 12 per pole
- Install Height 80 to 200 ft.
- 2 to 4 Large Ground Cabinets or in an Equipment Room

Small vs. Macro Cell – Pole Height



100 —

40 —



TIM BRADLEY IMAGING

Small Cell Components

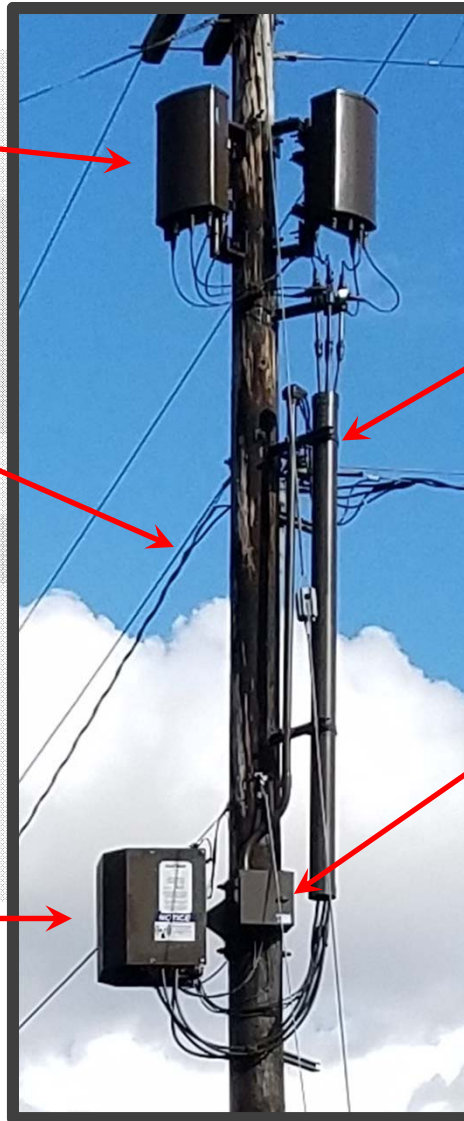
Antennas

Dark Fiber
(By Others)

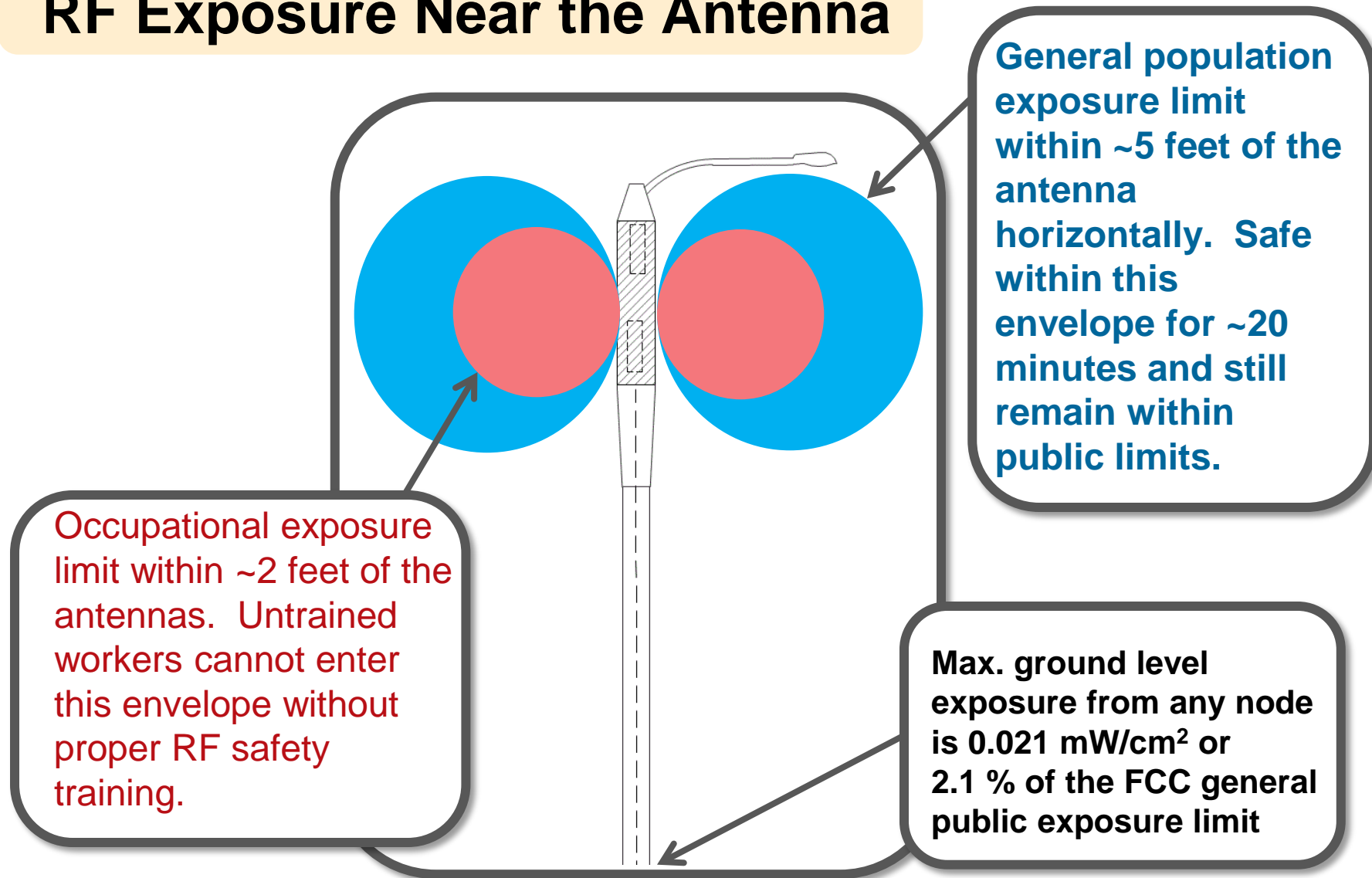
**Radios
Enclosure**

Conduit
(Power, Fiber, Coax)

**Power
Disconnect**



RF Exposure Near the Antenna



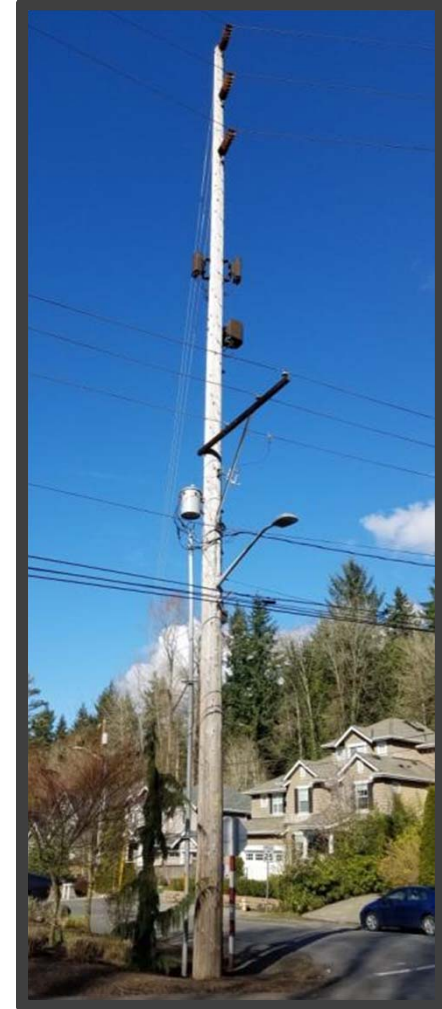
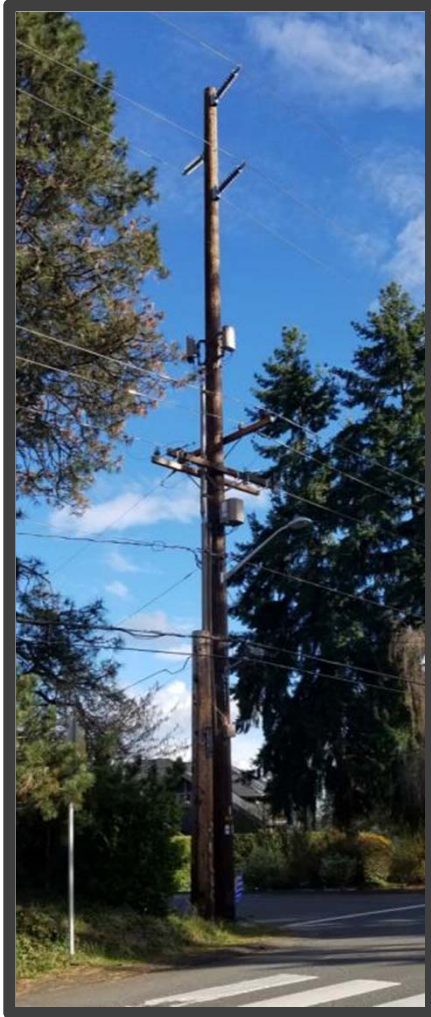
Utility Pole Install – Seattle



verizon✓

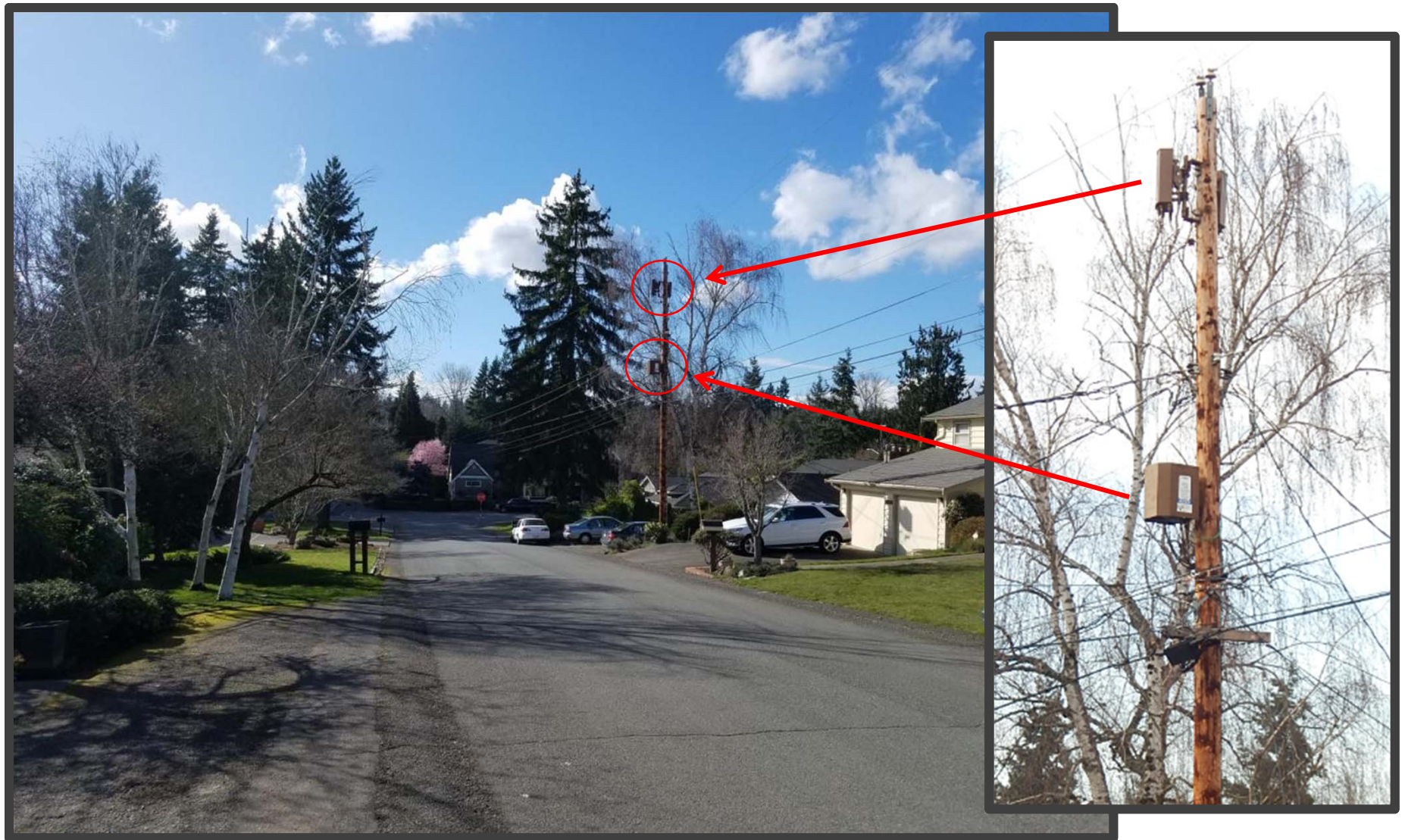
Seattle, WA (Ballard)

First Bellevue Installation – Archerline



Bellevue, WA (North Bellevue)
15 Nodes - PSE Poles

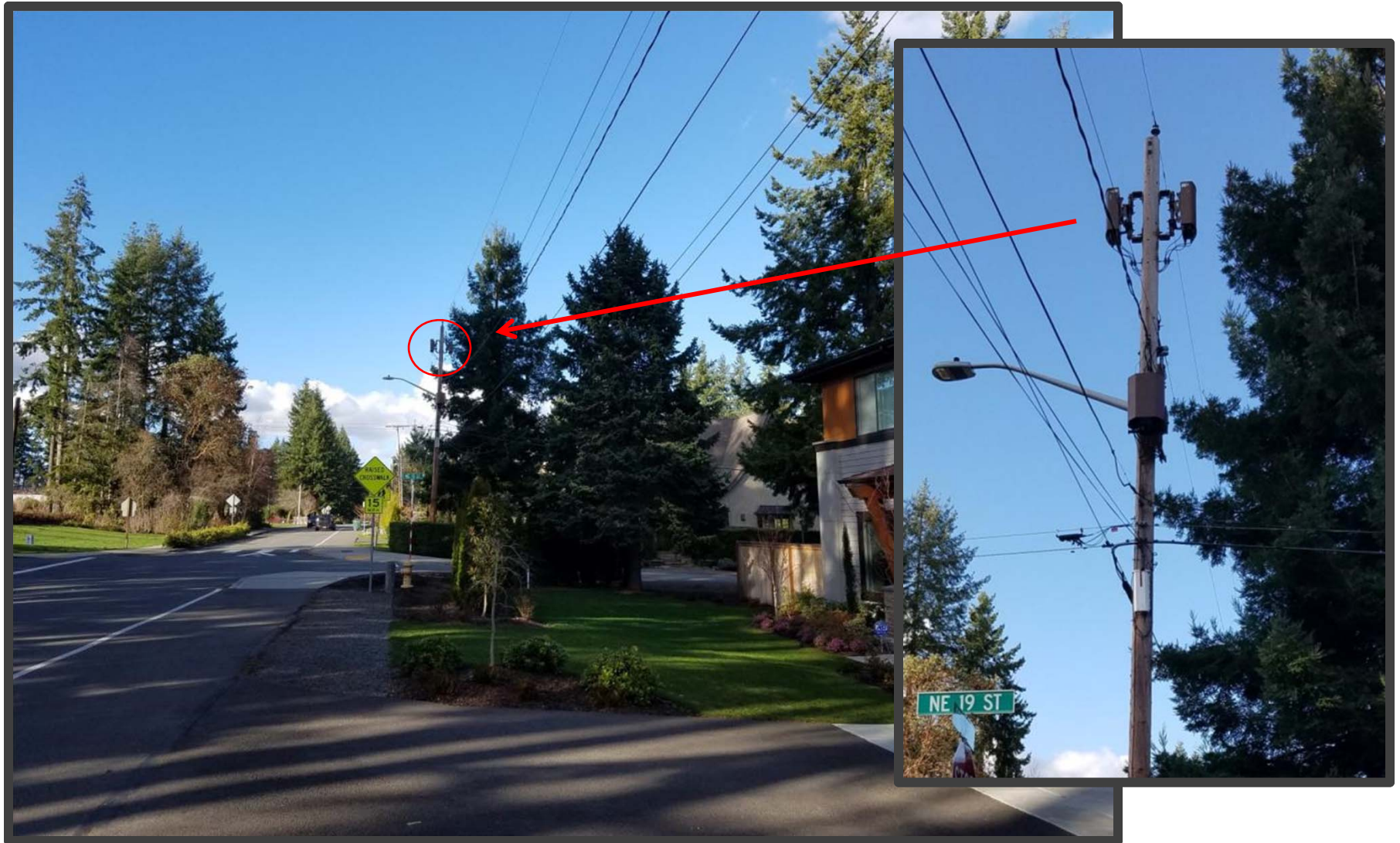
First Bellevue Installation – Archerline



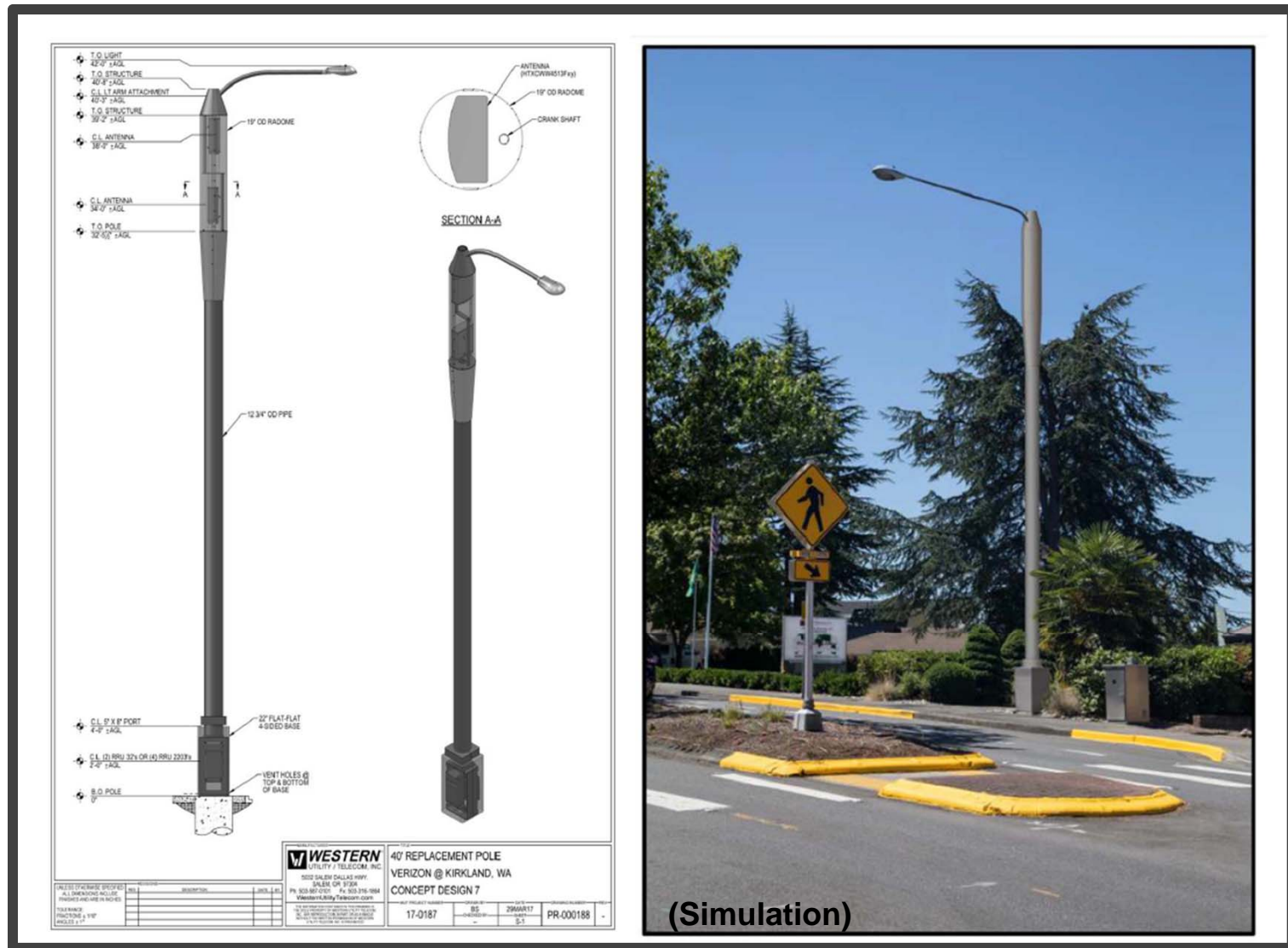
First Bellevue Installation – Archerline



First Bellevue Installation – Archerline



Light Standard



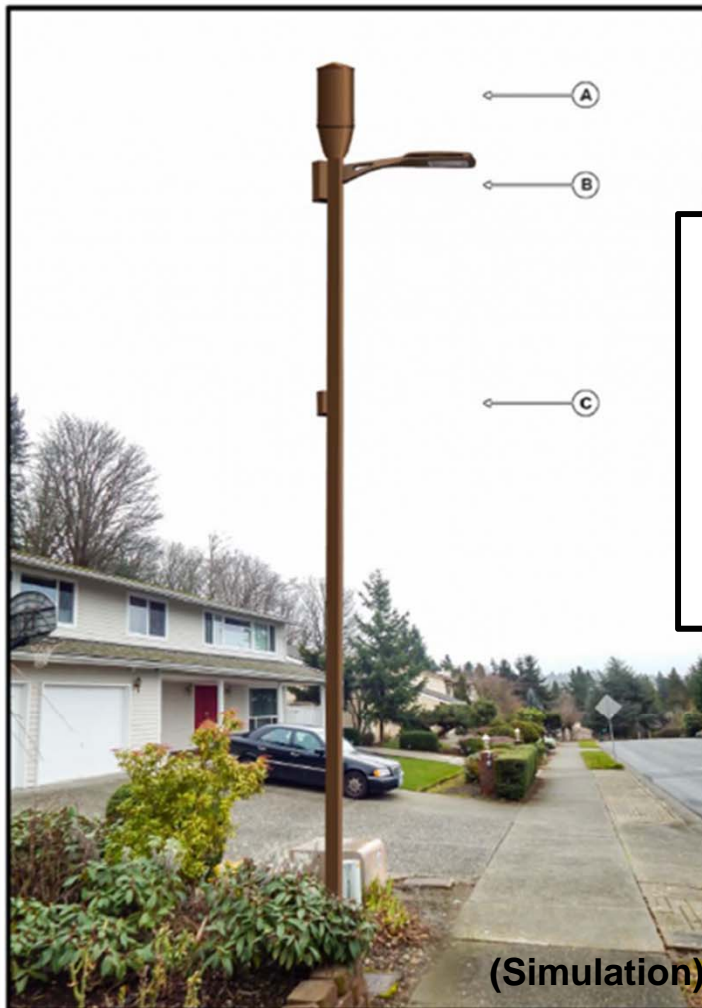
Light Standard



Light Standard



Light Standard



PROPOSED

City of
Bellevue

Puget
Sound
Energy

(A) Antenna
ANTELL CWT360x06Fx0
24" H x 14" W
28 lbs

(B) Radio 2203
7.88" H x 7.88" L x 3.94" D
11 lbs

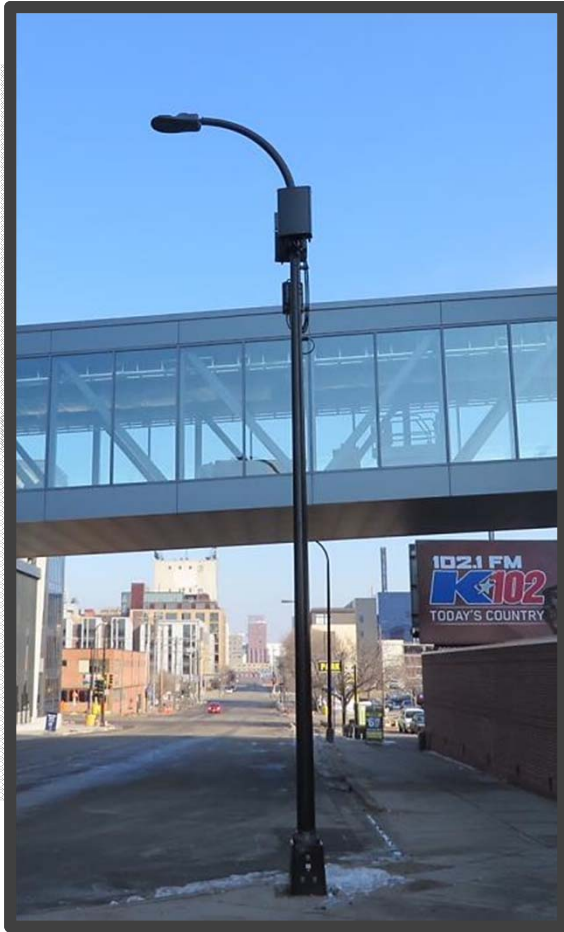
(C) Disconnect Box
9.75" H x 9.00" L x 5.25" D
WT. TBD



(Simulation)

PROPOSED

Light Standard

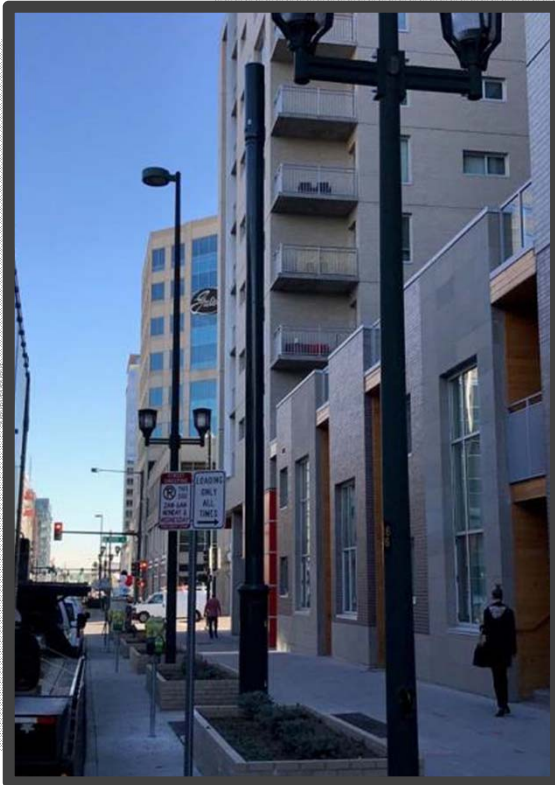


Minneapolis, MN



Kansas City, KS

Wireless Only Pole



Denver, CO



Equipment Inside of
Pole Base

Wireless Only Poles



Strand Mount – Seattle Trial



Combined antenna and radio units are mounted to a bracket that is hung on the fiber strand.

Fiber runs into the radios from nearby fiber termination box.

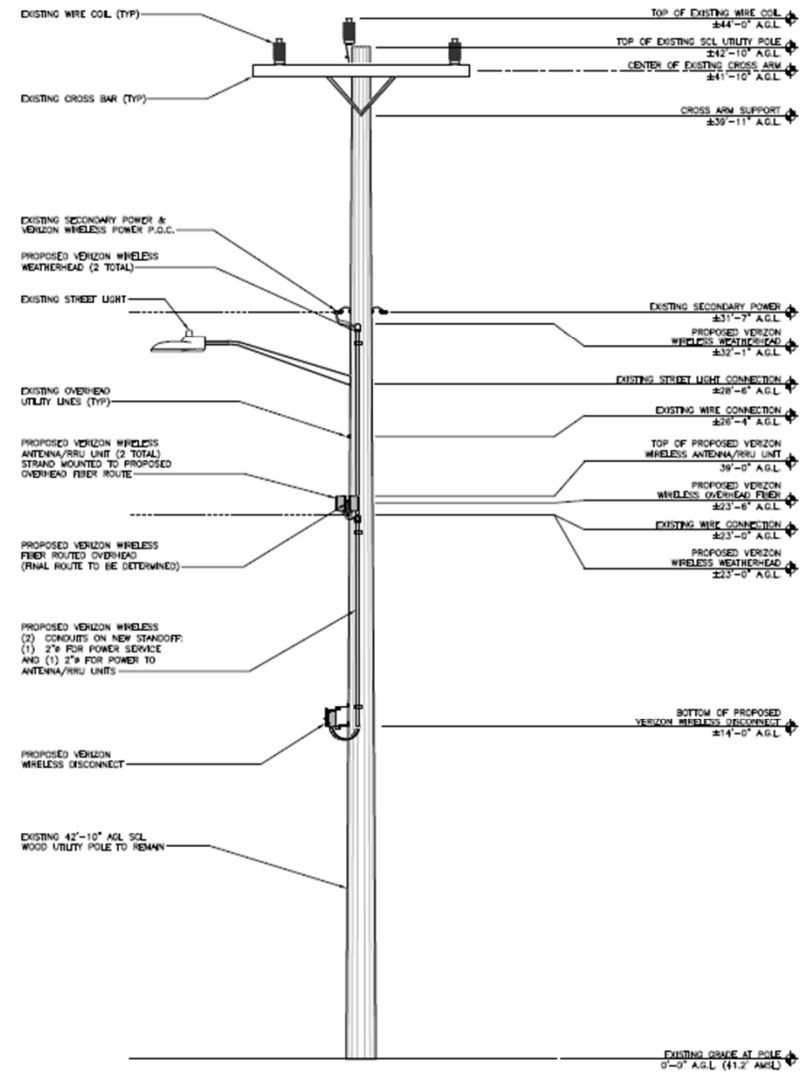
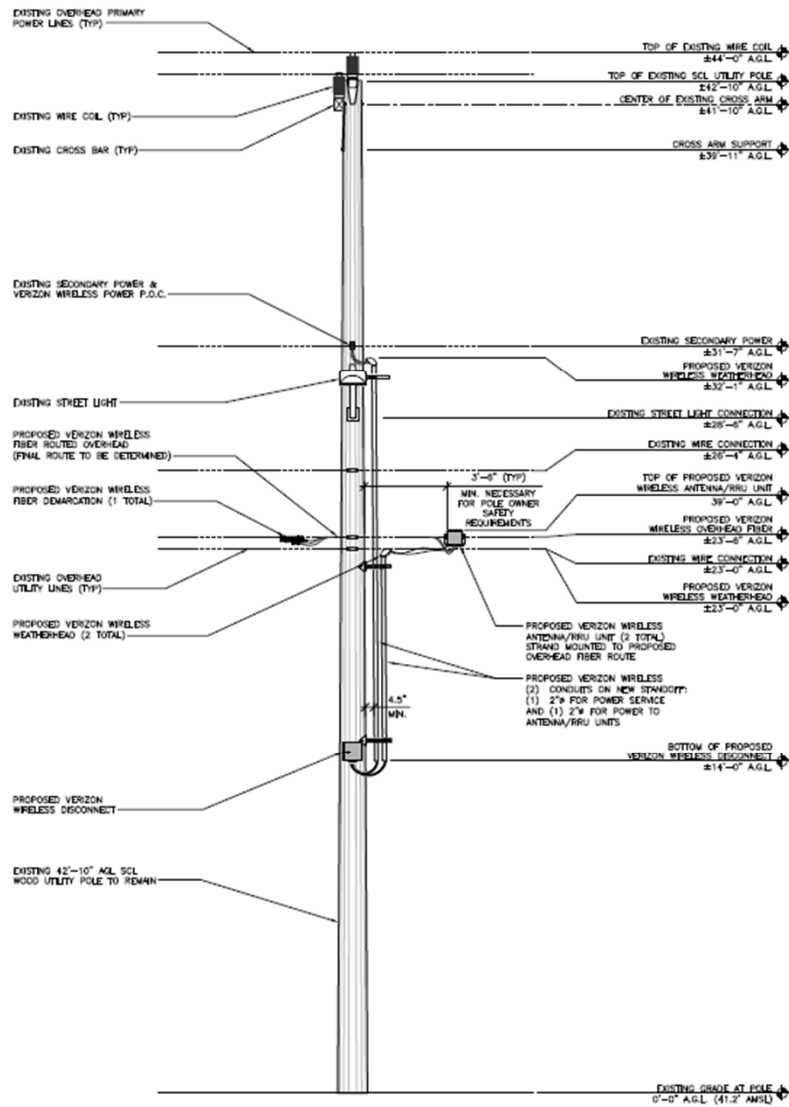


Conduit contains power lines running from the supply space to the power disconnect and then to the antenna and radio units.

The power disconnect is mounted to the pole



Strand Mount – Specifications



Strand Mount – Simulation



Thank you.